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SSBRP COMMUNICATION & DATA SYSTEM DEVELOPMENT USING THE UNIFIED MODELING LANGUAGE (UML)

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Introduction



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- **Space Station Biological Research Project**
 - ❖ Habitat Holding Racks
 - ❖ Centrifuge
 - ❖ Life Science Glovebox
- **Ames User Operation Facility (UOF)**
 - ❖ Payload Development Center
 - ❖ Telescience Support Center
- **Communication & Data System (CDS)**
 - ❖ System Infrastructure for Ames UOF



Communication & Data System

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Increment Specific

Payload Application

CDS Framework



Background

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- **CDS initially adopted Object Modeling Technology (OMT) [Rumbaugh]**
- **Extended OMT with Use Cases [Jacobson]**
- **Transitioned to Unified Modeling Language (UML) in 1997**
 - ❖ **Combined Rumbaugh & Jacobson with Booch**
 - ❖ **Adopted by Object Management Group**



CDS Requirements Analysis

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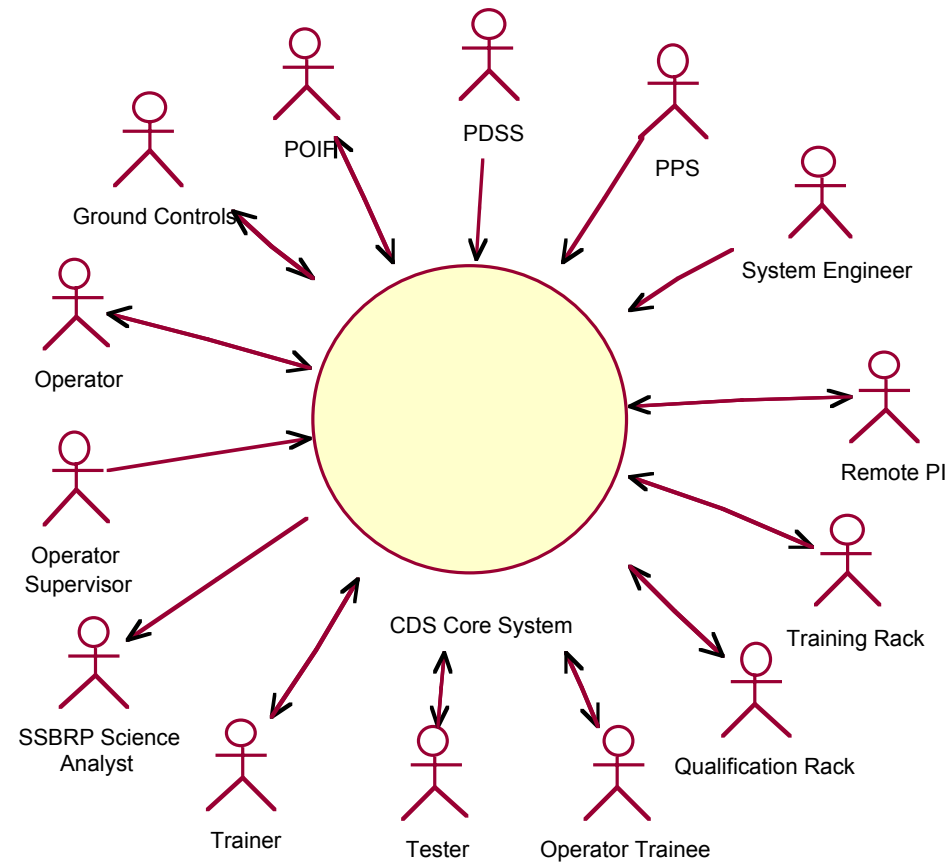
➤ Requirements Definition & Analysis

- ❖ Hardcopy Requirements Document
- ❖ System Context
- ❖ Use Cases
- ❖ Five Modes Defined
 - Operations
 - Planning
 - Simulations
 - Testing
 - Training



CDS Core System Context

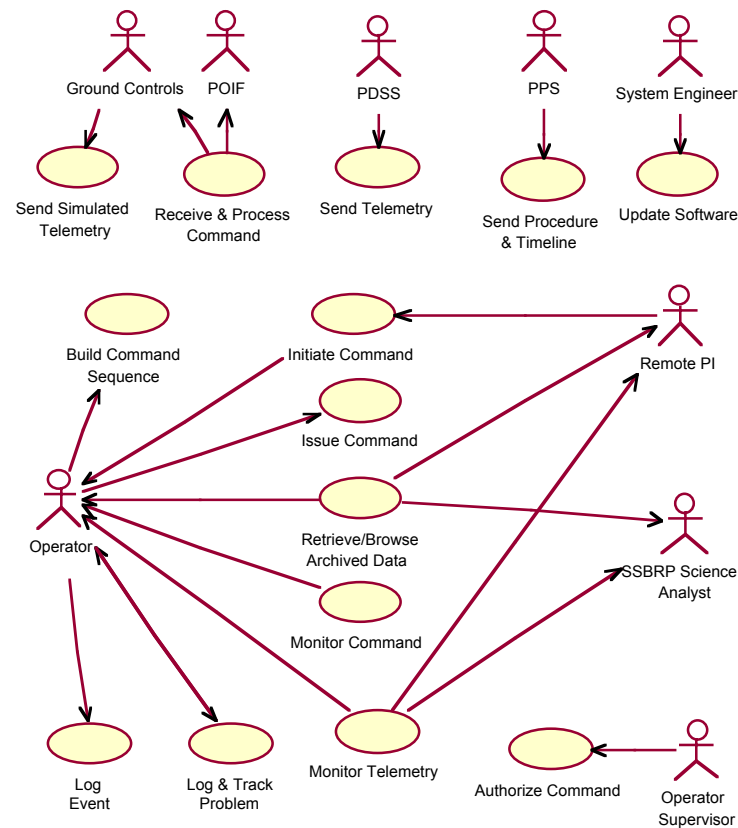
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CDS Operations Mode Use Case

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CDS Use Case Template

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CDS Core System

Operations Mode

Use Case:

Send Telemetry

Actor:

Pay load Data Services System (PDSS)

Description:

PDSS processes and distributes return link core and pay load telemetry data downlinked from the ISS. It also provides production data processing, line outage recording, 7 days of online data storage, and 2 years of offline data storage. PDSS is hosted at the Enhanced Huntsville Operations Support Center in MSFC. PDSS sends the processed SSBRP telemetry data to CDS.

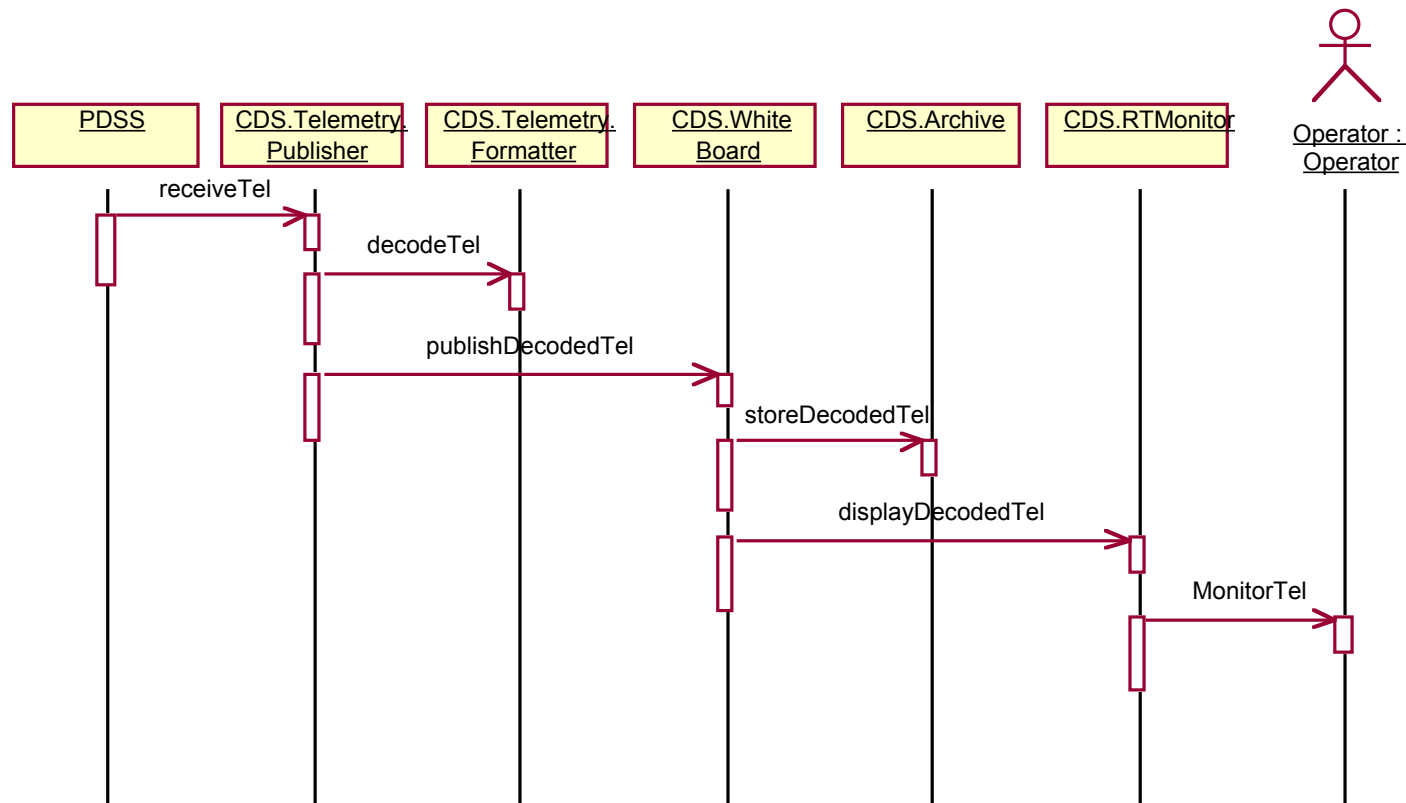
Side Effects:

PDSS in its current design does not process system requests to resend stored telemetry data. Therefore, UOF personnel have to log on the Pay load Information Management System (PIMS) manually to request the retransmission of data, rather than the retransmission being a part of the communication protocol.



PDSS Send Telemetry Sequence

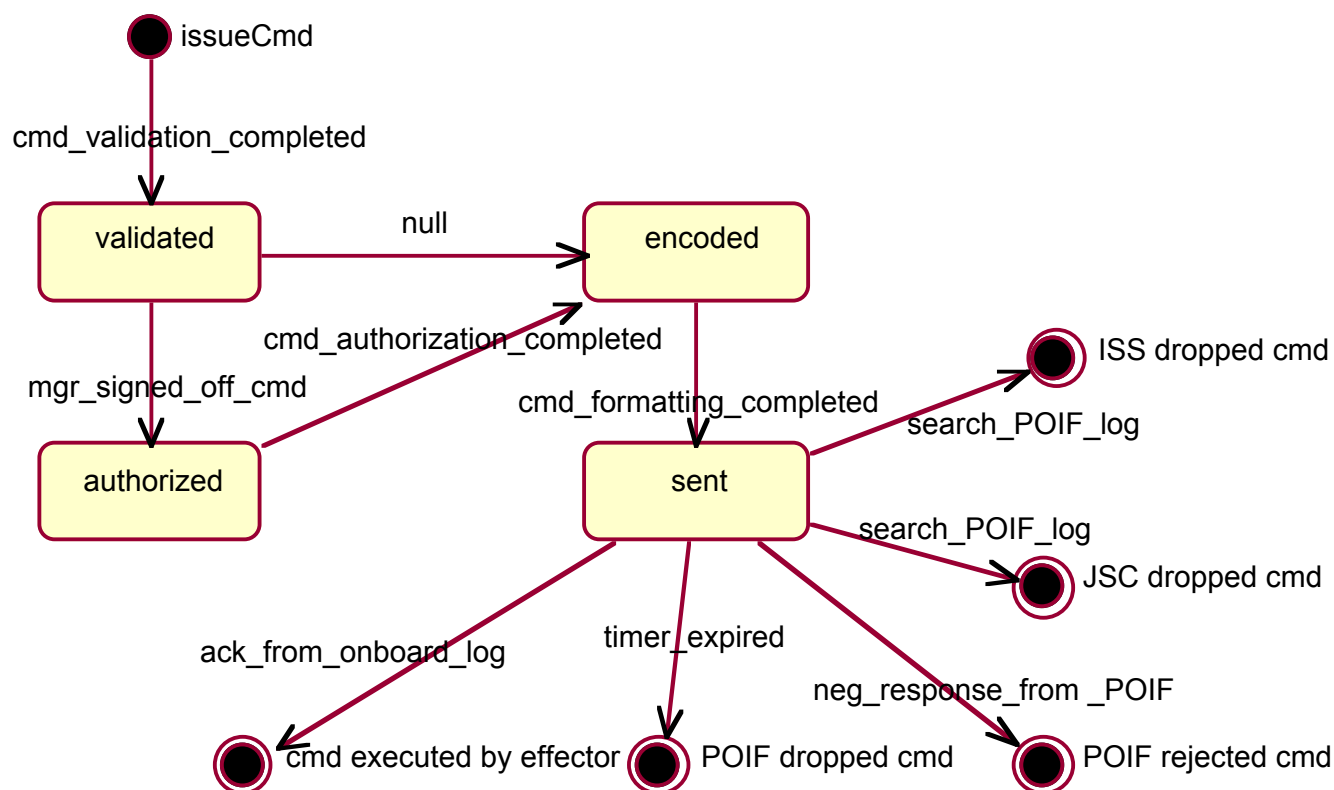
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CDS Command State Transition

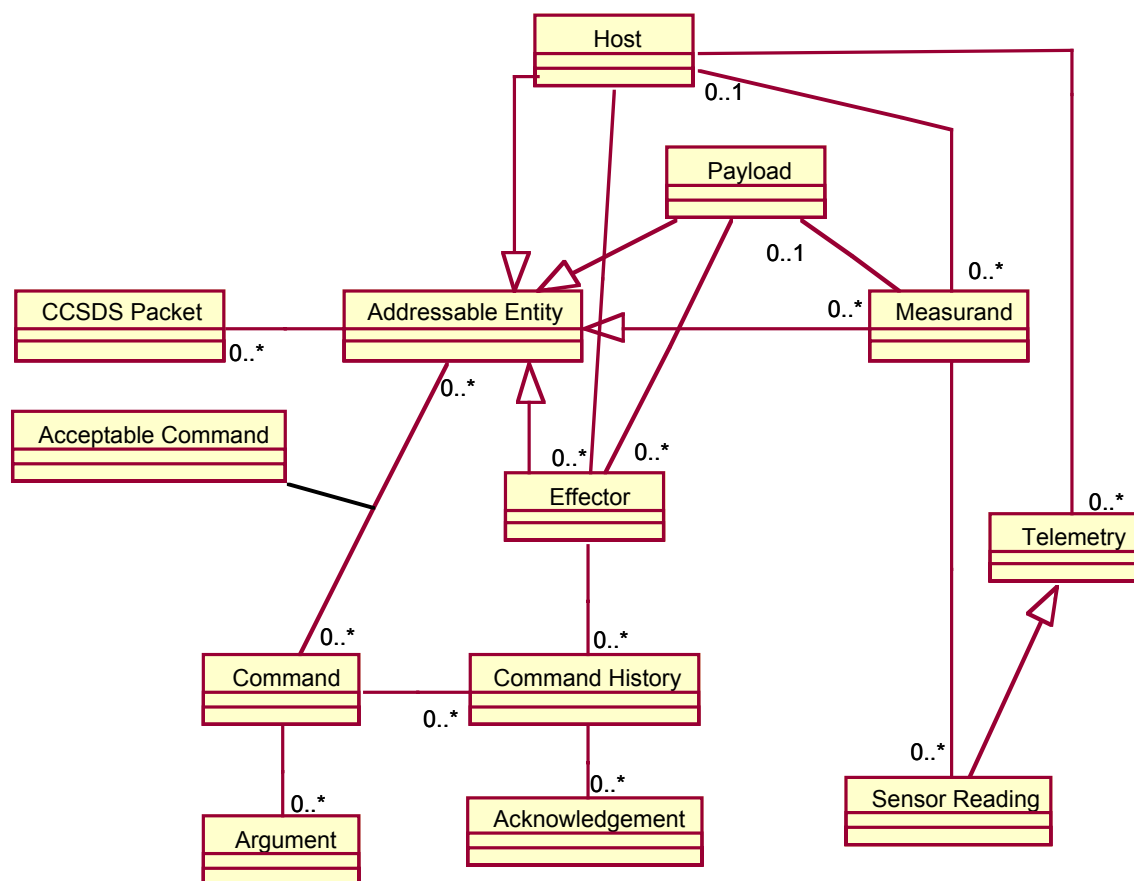
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Problem Domain Class Diagram

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CDS Architecture Analysis

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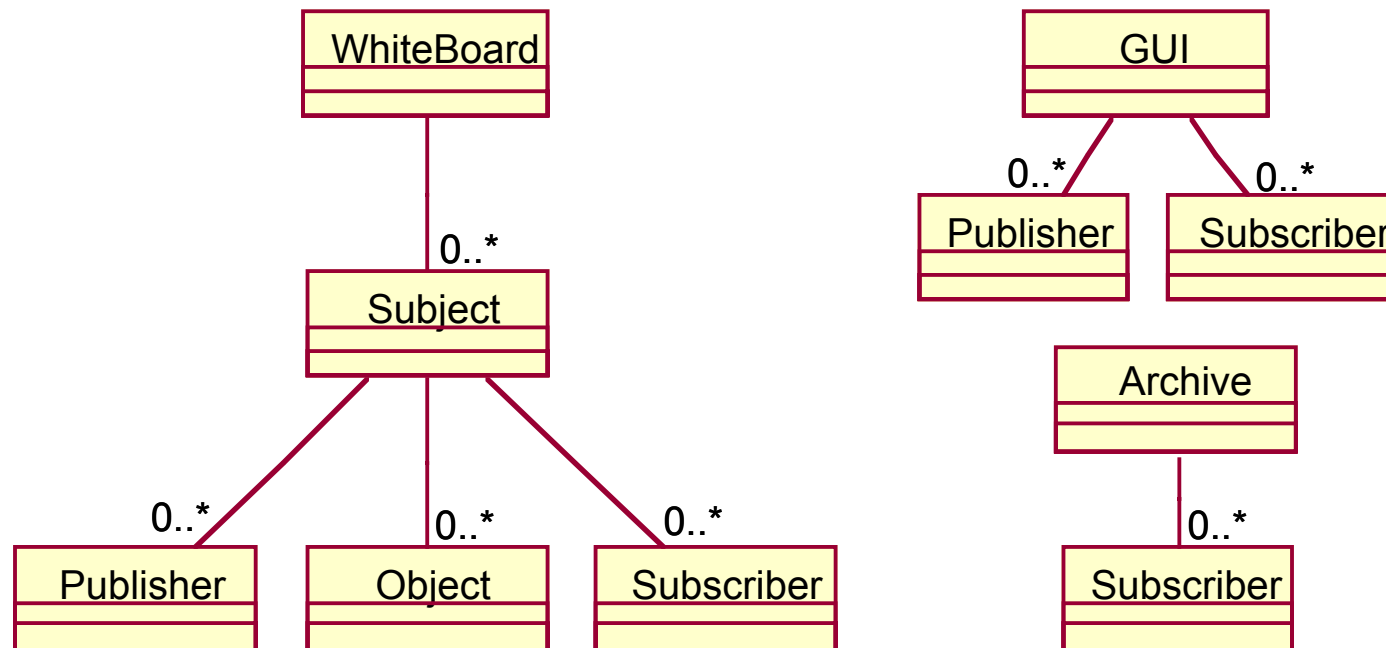


- **Top Level System Architecture emerges**
 - ❖ **Real Time System Class Diagram**
 - ❖ **Off Line System Class Diagram**



Real Time System Class Diagram

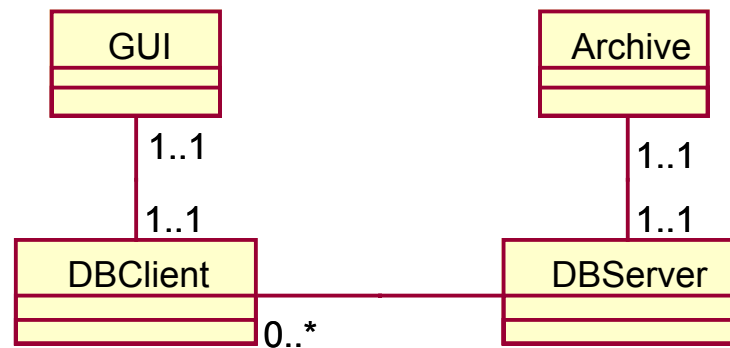
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Off Line System Class Diagram

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Conclusion

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➤ UML has vocabulary to define/design CDS

❖ Use Case Diagrams

- Interaction with outside world
- Requirements definition

❖ Class Diagrams

- Define problem-domain classes
- Define implementation classes

❖ Sequence Diagrams

- Describes the behavior/interactions of objects

❖ State Diagrams

- Life cycle of objects



CDS Design Phase

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- Refine system architecture
- Refine implementation class diagrams
- Define database schema
- Design user interfaces
- Define reports



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Questions

For More Information See - <http://geneve.arc.nasa.gov/CDS/home.html>